

### **REMARKS**

This is in response to the Office Action mailed July 26, 2006. Applicants are appreciative for the recognized allowable subject matter. This amendment should obviate outstanding issues and make the remaining claims allowable. Reconsideration of this application is respectfully requested in view of this amendment.

### **STATUS OF CLAIMS**

Claims 1-33 are pending.

Claims 11-15 are allowed.

Claims 1-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over non-patent literature "Least Expected Cost Query Optimization, An Exercise in Utility" (Chu) in view of U.S. 5,301,317 (Lohman).

Claims 7, 9, 19, 25, and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 7, 19, 25 and 31 are cancelled via the current amendment.

### **OVERVIEW OF CLAIMED INVENTION**

The present invention provides for a compilation time estimator (COTE) and a method implemented in the COTE for estimating optimization complexity by estimating the number of distinct join plans that will be generated, rather than the number of join sequences. The join enumerator in an optimizer is reused to iterate all the join pairs, but plan generation is bypassed. A small number of differentiating properties are accumulated during enumeration to calculate the

number of generated plans for each enumerated join. Hence, instead of estimating the number of join sequences, the present invention's COTE estimates the number of join plans (a finer granularity). Since the cost of generating a join plan is much more uniform than that of a join sequence, the estimator provides more accurate compilation time estimation.

The method of the present invention comprises the steps of: (a) reusing the existing join enumerator in an optimizer to iterate through all the possible join sequences, but bypassing the expensive plan generation step (to avoid the overhead of space allocation and cost estimation, etc); (b) determining a small number of differentiating properties (e.g., properties used to distinguish plans) that affect the number of plans generated for each join sequence and using those factors to calculate the number of generated plans; and (c) estimating the compilation time from the number of generated plans using a regression model (e.g., a linear regression model on the number of generated plans for each type of join method).

The compilation time estimator (COTE) of the present invention can be used for many other applications. For example, the COTE is useful in evaluating the need for mid-query reoptimization, in which an optimizer tries to generate a new plan in the middle of execution if a significant cardinality discrepancy is discovered. Since reoptimization itself takes time, the decision on whether to reoptimize or not is better made by comparing the execution cost of the remaining work with the estimated time to recompile.

Estimating the compilation time is also very useful for workload analysis tools. Examples of these tools are advisors for indexes, materialized views, and partitioning that have been built

on top of commercial database systems. All these tools spend most of their time compiling (but not executing) a large number of queries in the input workload as part of their tuning analysis, and run for hours or even days, depending on the workload. A compilation time estimator (COTE) is used to forecast how long such a tool would take to finish and possibly to show the progress of the tool as well.

### REJECTIONS/OBJECTIONS

Claims 1-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over non-patent literature “Least Expected Cost Query Optimization, An Exercise in Utility” (Chu) in view of U.S. 5,301,317 (Lohman). Claims 7, 9, 19, 25, and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 7, 19, 25 and 31 are cancelled via the current amendment.

Claims 1, 16, 22, and 28 have been amended to include allowable subject matter. The Examiner is hereby respectfully requested to withdraw the rejection with respect to the pending claims and further respectfully request the examiner to allow the pending claims. It should, however, be noted that the request to withdraw the rejections does not indicate that the applicants acquiesce with the arguments put forth by the Examiner.

### SUMMARY

As has been detailed above, none of the references, cited or applied, provide for the specific claimed details of applicants' presently claimed invention, nor renders them obvious. It

is believed that this case is in condition for allowance and reconsideration thereof and early issuance is respectfully requested.

This response is being filed with a request for extension of time. The Commissioner is hereby authorized to charge the extension fee, as well as any deficiencies in the fees provided to Deposit Account No. 09-0441.

If it is felt that an interview would expedite prosecution of this application, please do not hesitate to contact applicants' representative at the below number.

Respectfully submitted,

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